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EDITORIAL COMMENT

# Proficiency With Vascular Access

## Don't Rob Peter to Pay Paul*

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During the 2008 United States presidential election, political pundits and statisticians worked feverishly to predict who would be elected as the next resident of the White House. While many of their models took into account public polling, other methods relied on more exotic data. One list of predictors showed a correlation between such events as the football team the Washington Redskins winning or losing their final home game of the season, or variables such as the height of the candidates, the sales of Halloween masks portraying each candidate, the length of the candidates' last name, or whether it was fashionable at the time for women to wear their eyebrows thick or thin (1). Of the 11 unconventional predictors examined, 6 predicted that Barack Obama would win the presidency. Because he was indeed elected to the office in 2008, does the Obama campaign owe a debt of gratitude to the Washington Redskins or to thick eyebrows? In other words, is the Obama win *attributable* to any of these less-than-convincing predictors? Of course not—it is highly unlikely that any of these "predictors" actually caused Barack Obama to win the election; however, what the exercise proved is the idiom that correlation is not causation.

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In this issue of *JACC: Cardiovascular Interventions,* Azzalini et al. (2) compare the observed rate of vascular complications between patients studied in the past decade (April 2006 to March 2008) and a historical control group from almost 20 years ago (April 1996 to March 1998) at a tertiary center in Canada. During the more recent era, the radial approach accounted for 46% of procedures, whereas during the historical period, all procedures were performed via the femoral artery. There were important differences in the characteristics of the studied populations. Patients treated during the contemporary period were more often female, were significantly older, and had more comorbidities, including diabetes mellitus, peripheral arterial disease, and chronic kidney disease. Given these differences, it is likely that many other unmeasured confounders were also present. The unadjusted rate of vascular complications was similar in both groups. After adjustment, the rate of vascular complications was significantly higher in the more recent cohort. The authors performed a complex statistical analysis to estimate the proportion of vascular complications in the modern era "attributable" to the radial approach. They conclude that 52.7% of vascular complications occurring in patients undergoing transfemoral procedures were attributable to radial access and suggest that by eliminating it, more than one-half of vascular complications in patients undergoing the femoral approach could have been avoided.

The authors should be congratulated for addressing the important issue of maintaining proficiency with vascular access in an environment of rapid change. Their interest in tracking complications should also be acknowledged because the first step in reducing complications is to measure their frequency. However, what is the overarching clinical message? Should we now reverse the adoption of the radial access and go back to the femoral approach? Their assertion that femoral complications could be avoided by eliminating the radial approach not only goes against much of the published literature, both randomized and observational, showing overwhelmingly that the radial approach is superior to the

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femoral approach in preventing vascular complications (3), but also represents causality language that is not exactly supported by their observational study. By using the term *attributable*, the authors imply causation—that the radial approach *caused* femoral complications. From a purely anatomic standpoint, it is challenging to understand how accessing the radial artery would lead to a femoral artery vascular complication, but perhaps the point is that adoption of the radial approach was *associated* with an increase in femoral complications at this center. The reasons underlying this association are worth discussion.

Proficiency with medical procedures requires intensive training and continued practice. This is the underlying basis for the volume-outcome relationship that has shown fewer complications and improved outcomes at centers that perform a large number of procedures (4). The relationship between experience and outcome exists for surgical procedures and endovascular procedures such as percutaneous coronary intervention (PCI), even in the contemporary era of deliverable drug-eluting stents and sophisticated pharmacotherapy (5) and for the most basic aspects of the procedure such as obtaining vascular access (6). In the current environment where there is increasing interest in the radial approach, studies show a relationship between a higher transradial PCI volume and improved clinical outcomes, as well as lower rates of radiation exposure, contrast use, and bailout to femoral access (7,8). Thus, the volume-outcome relationship appears to extend across specialties, procedures, and even specific aspects of individual procedures.

Proficiency with transradial PCI means that high-risk cases, i.e., patients with ST-segment elevation myocardial infarction, elderly patients, patients in shock, are all approached with a "radial first" philosophy. The data largely support the role of radial access in these situations (9), with randomized trial data even demonstrating a survival advantage in primary PCI (10). Despite this compelling evidence and professional society guidelines recommending a "radial first" approach for PCI (a Level IA recommendation by the European Society of Cardiology), multiple studies demonstrate the "risk-treatment paradox" wherein low-risk patients are selected for radial access and high-risk patients are selected for femoral access (11). As mentioned in the study by Azzalini et al. (2) (and in other similar studies that report similar observations), patients selected for femoral access had more comorbidities than those selected for radial access; in fact, there was a higher incidence of risk factors for major vascular complications in the femoral group. For example, the rate of concomitant venous access was 23.0% in the femoral group and only 0.8% in the radial group. In addition, 31.1% of patients undergoing femoral access received a vascular closure device, which may be associated with an increase in complications. Therefore, it appears that the risk-treatment paradox, rather than a "radial paradox," was present in this study. Less than one-half of the patients in the recent cohort of the Azzalini et al. (2) study underwent transradial procedures; recent data suggest that the advantage of radial access over femoral access may not be manifest unless a center's proportion of transradial procedures is ≥80% (10). Rather than laying the blame on the adoption of the radial approach, the authors rightly propose that a better strategy to reduce vascular complications at the patient level may be to have a wider application of the radial access such that patients at high risk of vascular complications can be treated using the safest approach.

Of course, it is unlikely that 100% of patients will undergo transradial PCI at any center. Although ulnar artery access may be feasible in some patients (12), anatomic variants in the arm vasculature or the need for very large bore access may necessitate use of femoral access. In this context, the authors again appropriately emphasize the importance of appropriate femoral artery puncture. There is a strong association between access in the common femoral artery and a reduced incidence of major and minor complications compared with access below the femoral artery bifurcation or above the hypogastric artery (13). Of all of the methods to safely access the femoral artery (e.g., fluoroscopy, micropuncture), only ultrasound guidance has been shown to reliably facilitate puncture in the "safe zone," particularly in patients at higher risk of femoral complications like those patients who are obese (6). Whether the operators in the study by Azzalini et al. used ultrasound guidance for femoral artery access is unknown, but the adoption of ultrasound for vascular access worldwide is likely very low.

There are several important lessons to be learned from the study by Azzalini et al. (2). First is that observational data can only demonstrate associations. Second is the importance of elucidating the reasons for the observed associations. Third, and perhaps most important, is that once the reasons are found, practice patterns should evolve to address those reasons to improve outcomes. In the context of vascular access, maintaining proficiency in basic techniques and monitoring outcomes is essential.

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